US007374403B2

(12) **United States Patent**
Decker et al.

(10) **Patent No.: US 7,374,403 B2**
(45) **Date of Patent: May 20, 2008**

(54) **LOW SOLIDITY TURBOFAN**

(75) Inventors: **John Jared Decker**, Liberty Township, OH (US); **Peter Nicholas Szucs**, West Chester, OH (US); **William Joseph Solomon**, Cincinnati, OH (US); **Virginia Louise Wilson**, Walton, KY (US)

(73) Assignee: **General Electric Company**, Schenectady, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 524 days.

(21) Appl. No.: **11/100,752**

(22) Filed: **Apr. 7, 2005**

(65) **Prior Publication Data**

US 2006/0228206 A1 Oct. 12, 2006

(51) **Int. Cl.**
F01D 25/24 (2006.01)

(52) **U.S. Cl.** ..... **416/223 R**; 416/223 A; 416/228; 416/238; 416/242; 416/DIG. 5

(58) **Field of Classification Search** ..... 415/1, 415/173.1, 192, 220, 222; 416/223 R, 223 A, 416/228, 238, 242, 243, DIG. 5
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,358,246	A		11/1982	Hanson et al.
4,971,520	A		11/1990	Van Houten
5,167,489	A		12/1992	Wadia et al.
5,169,288	A		12/1992	Gliebe et al.
5,273,400	A		12/1993	Amr
5,478,199	A		12/1995	Gliebe
5,584,660	A		12/1996	Carter et al.
5,642,985	A		7/1997	Spear et al.
5,735,673	A	*	4/1998	Matheny et al. ..... 416/223 A
5,769,607	A		6/1998	Neely et al.
5,810,555	A		9/1998	Savage et al.
5,906,179	A		5/1999	Capdevila
6,048,174	A		4/2000	Samit et al.
6,059,532	A		5/2000	Chen et al.
6,071,077	A		6/2000	Rowlands
6,315,521	B1		11/2001	Hunt
6,328,533	B1		12/2001	Decker et al.
6,338,609	B1		1/2002	Decker et al.
6,368,061	B1		4/2002	Capdevila
6,386,830	B1		5/2002	Slipper et al.

(Continued)

OTHER PUBLICATIONS

Cumpsty, "Compressor Aerodynamics," 1989, pp: Cover, copyr., variables, 214, and 215.

(Continued)

Primary Examiner—Igor Kershteyn
(74) *Attorney, Agent, or Firm*—William S. Andes; Francis L. Conte

(57) **ABSTRACT**

A turbofan includes a row of fan blades extending from a supporting disk inside an annular casing. Each blade includes an airfoil having opposite pressure and suction sides extending radially in span between a root and tip and axially in chord between leading and trailing edges. Adjacent airfoils define corresponding flow passages therebetween for pressurizing air. Each airfoil includes stagger increasing between the root and tip, and the flow passage has a mouth between the airfoil leading edge and the suction side of an adjacent airfoil and converges to a throat aft from the mouth. The row includes no more than twenty fan blades having low tip solidity for increasing the width of the passage throat.

28 Claims, 6 Drawing Sheets